What is claimed is:

1.   Apparatus for constructing a quantifiable model, the apparatus comprising:

5   an object definer for converting user input into at least one cell having inputs and outputs,

a relationship definer for converting user input into relationships associated with said cells such that each said relationships is associatable with said cells via one of said inputs and outputs,

10   a quantifier for analyzing a data set to be modeled to assign quantitative values to said relationships and to associate said quantitative values with said associated inputs and outputs, thereby to generate a quantitative model.

2.   Apparatus according to claim 1, further comprising a verifier for

15   verifying at least one relationship, said verifier comprising determination functionality for determining whether said associated quantitative value is above a threshold value and deletion functionality for deleting said associated input or output if said quantitative value is below said threshold value.

20   3.   Apparatus according to claim 1, wherein said quantifier comprises a statistical data miner.

4. Apparatus according to claim 1, wherein said quantifier comprises any one of a group including: linear regression, nearest neighbor, clustering, process output empirical modeling (POEM), classification and regression tree (CART), chi-square automatic interaction detector (CHAID) and neural network

5   empirical modeling.

5. Apparatus according to claim 1, wherein said data is a predetermined empirical data set.

10   6. Apparatus according to claim 1, wherein said data is a preobtained empirical data set describing any one of a group comprising a biological process, sociological process, a psychological process, a chemical process, a physical process and a manufacturing process.

15   7. Apparatus according to claim 1, wherein said quantitative model is a predictive model usable for decision making.

8. Apparatus for studying a process having an associated empirical data set, the apparatus comprising:

20   an object definer for converting user input into at least one cell having inputs and outputs,

a relationship definer for converting user input into relationships associated with said cells such that each said relationships is associatable with said cells via one of said inputs and outputs,

a quantifier for analyzing said associated empirical data set to assign

5   quantitative values to said relationships and to associate said quantitative values with said associated inputs and outputs, thereby to generate a quantitative model.

9.   Apparatus according to claim 8, further comprising a verifier for verifying at least one relationship, said verifier comprising determination

10   functionality for determining whether said associated quantitative value is above a threshold value and deletion functionality for deleting said associated input or output if said quantitative value is below said threshold value.

10.   Apparatus according to claim 8, wherein said quantifier comprises

15   a statistical data miner.

11.   Apparatus according to claim 8, wherein said quantifier comprises functionality for any one of a group including: linear regression, nearest neighbor, clustering, process output empirical modeling (POEM), classification

20   and regression tree (CART), chi-square automatic interaction detector (CHAID) and neural network empirical modeling.

12. Apparatus according to claim 8, wherein said data is a predetermined empirical data set of said process.

13. Apparatus according to claim 8, wherein said process comprises
5 any one of a group comprising a biological process, sociological process, a psychological process, a chemical process, a physical process and a manufacturing process.

14. Apparatus according to claim 8, wherein said quantitative model is
10 a predictive model usable for decision making.

15. Apparatus for constructing a predictive model for a process, the apparatus comprising:

an object definer for converting user input into at least one cell having
15 inputs and outputs,

a relationship definer for converting user input into relationships associated with said cells such that each said relationships is associatable with said cells via one of said inputs and outputs,

a quantifier for analyzing a data set relating to said process to be modeled
20 to assign quantitative values to said relationships and to associate said quantitative values with said associated inputs and outputs, thereby to generate a model predictive of said process.

16. Apparatus according to claim 15, further comprising a verifier for verifying at least one relationship, said verifier comprising determination functionality for determining whether said associated quantitative value is above a threshold value and deletion functionality for deleting said associated input or

5 output if said quantitative value is below said threshold value.

17. Apparatus according to claim 15, wherein said quantifier comprises a statistical data miner.

10 18. Apparatus according to claim 15, wherein said quantifier comprises functionality for any one of a group including: linear regression, nearest neighbor, clustering, process output empirical modeling (POEM), classification and regression tree (CART), chi-square automatic interaction detector (CHAID) and neural network empirical modeling.

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19. Apparatus according to claim 15, wherein said data is a predetermined empirical data set of said process.

20. Apparatus according to claim 15, wherein said process comprises

20 any one of a group comprising a biological process, sociological process, a psychological process, a chemical process, a physical process and a manufacturing process.

21. Apparatus according to claim 15, further comprising an automatic decision maker for using said predictive model together with state readings of said process to make feed forward decisions to control said process.

5   22. Apparatus according to claim 15, wherein said quantitative model is a predictive model usable for decision making.

23. Apparatus for reduced dimension data mining comprising:

an object definer for converting user input into at least one cell having

10   inputs and outputs,

a relationship definer for converting user input into relationships associated with said cells such that each said relationships is associatable with said cells via one of said inputs and outputs,

a quantifier for analyzing a data set relating to a process to be modeled

15   comprising a selective data finder to find data items associated with said relationships and ignore data items not related to said relationships, said quantifier being operable to use said found data to assign quantitative values to said relationships and to associate said quantitative values with said associated inputs and outputs.

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24. Apparatus according to claim 23, further comprising a verifier for verifying at least one relationship, said verifier comprising determination functionality for determining whether said associated quantitative value is above

a threshold value and deletion functionality for deleting said associated input or output if said quantitative value is below said threshold value.

25.   Apparatus according to claim 23, wherein said quantifier comprises a statistical data miner.

26.   Apparatus according to claim 23, wherein said quantifier comprises functionality for any one of a group including: linear regression, nearest neighbor, clustering, process output empirical modeling (POEM), classification and regression tree (CART), chi-square automatic interaction detector (CHAID) and neural network empirical modeling.

27.   Apparatus according to claim 23, wherein said data is a predetermined empirical data set of said process.

28.   Apparatus according to claim 23, wherein said process comprises any one of a group comprising a biological process, sociological process, a psychological process, a chemical process, a physical process and a manufacturing process.

29.   A method of constructing a quantifiable model, comprising:

converting user input into at least one cell having inputs and outputs,

converting user input into relationships associated with said cells such that each said relationship is associated with said cells via one of said inputs and outputs,

analyzing a data set to be modeled to assign quantitative values to said

5   relationships and to associate said quantitative values with said associated inputs and outputs, thereby to generate a quantitative model.

30.   A method for reduced dimension data mining comprising:

converting user input into at least one cell having inputs and outputs,

10   converting user input into relationships associated with said cells such that each said relationship is associated with said cells via one of said inputs and outputs,

analyzing a data set relating to a process to be modeled comprising a finding data items associated with said relationships and ignoring data items not

15   related to said relationships, and using said found data to assign quantitative values to said relationships and to associate said quantitative values with said associated inputs and outputs.

31.   A knowledge engineering tool for verifying an alleged relationship

20   pattern within a plurality of objects, the tool comprising

a graphical object representation comprising a graphical symbolization of the objects and assumed interrelationships, said graphical symbolization including a plurality of interconnection cells each representing one of said

objects, and inputs and outputs associated therewith, each qualitatively representing an alleged relationship, and

a quantifier for analyzing a data set of said objects to assign quantitative values to said relationships and to associate said quantitative values with said alleged relationships, thereby to verify said alleged relationships.

32. The knowledge engineering tool as in claim 31, wherein said quantifier comprises a selective data finder to find data items associated with said relationships and ignore data items not related to said relationships such that only said found data are used in assigning quantitative values to said relationships and associating said quantitative values with said associated inputs and outputs..

33. The knowledge engineering tool as in claim 31 further comprising automatic initial layout functionality for arranging said inputs and outputs as interconnections between said cells and independent inputs and independent outputs in accordance with an a priori structural knowledge of said system.

34. The knowledge engineering tool as in claim 33 wherein said automatic initial layout functionality is configured to derive layout information from any one of a group consisting of process flow diagrams, process maps, structured questionnaire charts and layout drawings of said system.

35. The knowledge engineering tool as in claim 31 wherein at least one of said inputs is selected from the group consisting of a measurable input and a controllable input.

5   36. The knowledge engineering tool as in claim 31, wherein an output of a first of said interconnection cells comprises an input to a second of said interconnection cells.

37. The knowledge engineering tool as in claim 36 wherein said output

10   is a controllable output to said first interconnection cell and a measurable input to said second interconnection cell.

38. A machine readable storage device, carrying data for the construction of:

15   an object definer for converting user input into at least one cell having inputs and outputs,

a relationship definer for converting user input into relationships associated with said cells such that each said relationships is associatable with said cells via one of said inputs and outputs, and

20   a quantifier for analyzing a data set to be modeled to assign quantitative values to said relationships and to associate said quantitative values with said associated inputs and outputs, thereby to generate a quantitative model.

39. Machine readable storage device according to claim 38, wherein said quantitative model is a predictive model usable for decision making.

40. Data mining apparatus for using empirical data to model a process, comprising:

a data source storage for storing data relating to a process,

a functional map for describing said process in terms of expected relationships,

a relationship quantifier, connected between said data source storage and said functional process map, for utilizing data in said data storage to associate quantities with said expected relationships,

thereby to provide quantified relationships to said functional map, thereby to model said process.

41. Apparatus according to claim 40, further comprising a functional map input unit for allowing users to define said expected relationships, thereby to provide said functional map.

42. Apparatus according to claim 40, further comprising a relationship validator associated with said relationship quantifier to delete relationships from said model having quantities not reaching a predetermined threshold.

43. Apparatus for obtaining new information regarding a process having an associated empirical data set, the apparatus comprising:

an object definer for converting user input into at least one cell having inputs and outputs,

5   a relationship definer for converting user input into relationships associated with said cells such that each said relationships is associatable with said cells via one of said inputs and outputs,

a quantifier for analyzing said associated empirical data set to assign quantitative values to said relationships and to associate said quantitative values

10   with said associated inputs and outputs, thereby to generate a quantitative model, said quantitative values comprising new information of said process.

44. Apparatus according to claim 43, further comprising a verifier for verifying at least one relationship, said verifier comprising determination

15   functionality for determining whether said associated quantitative value is above a threshold value and deletion functionality for deleting said associated input or output if said quantitative value is below said threshold value.

45. Apparatus according to claim 43, wherein said quantifier comprises

20 a statistical data miner.

46. Apparatus according to claim 43, wherein said quantifier comprises functionality for any one of a group including: linear regression, nearest

neighbor, clustering, process output empirical modeling (POEM), classification and regression tree (CART), chi-square automatic interaction detector (CHAID) and neural network empirical modeling.

5   47.   Apparatus according to claim 43, wherein said data is a predetermined empirical data set of said process.

48.   Apparatus according to claim 43, wherein said process comprises any one of a group comprising a biological process, sociological process, a

10   psychological process, a chemical process, a physical process and a manufacturing process.

49.   A method for automated decision-making by a computer comprising the steps of:

15   (i)   modeling of relations between a plurality of objects, each object among said plurality of objects having at least one outcome, each object among said plurality of objects being subjected to at least one influential factor possibly affecting said at least one outcome;

20   (ii)   data mining in datasets associated with said modeled relations between said at least one outcome and said at least one influential factor of at least one object among said plurality of objects;

(iii)   building a quantitative model to predict a score for said at least

25   one outcome, and

(iv)   making a decision according to said score of said at least one outcome of said at least one object.